

Trend Study 11B-5-05

Study site name: B Canyon.

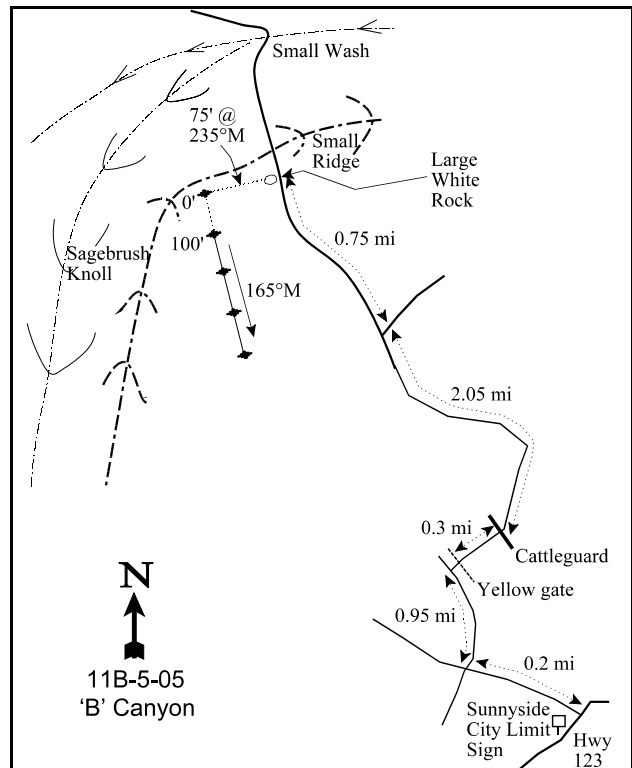
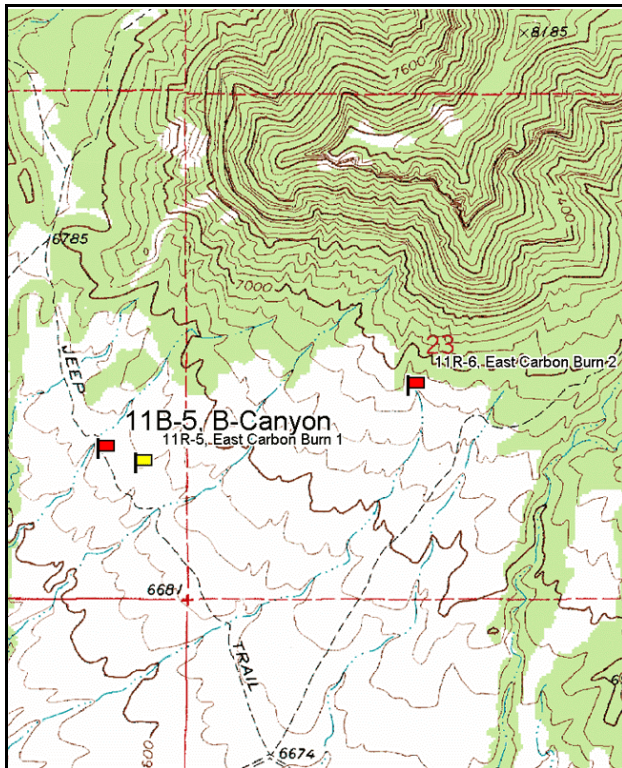
Vegetation type: Chained, Seeded P-J Burn.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Sunnyside City limit sign on Highway 123 at the west end of town, turn north and go 0.2 miles, passing the East Carbon High School football field. Turn right and go 0.95 miles. Turn right and pass through a yellow metal gate, continuing 0.3 miles to a cattle guard. Stay on the main road and go north 2.05 miles to an intersection. Keep left at the intersection (right turn goes to A Canyon transect) and go 0.75 miles more to just beyond the crest of a small hill. On the left side of the road you should find a large white rock. The transect, marked by a red painted rebar (tag #7894), starts 75 feet away at a bearing of 235°M.



Map Name: Sunnyside

Diagrammatic Sketch

Township 14S, Range 13E, Section 22

GPS: NAD 27, UTM 12S 4382171 N, 547991 E

DISCUSSION

'B' Canyon Trend Study No. 11B-5

This study is located near the mouth of 'B' Canyon on the gentle (7%) west-facing slope at the base of the Book Cliffs. Elevation at the site is 6,700 feet. The site is about 4 miles northwest of Sunnyside. Plans have been proposed to mine 15 million tons of coal from the 'B' Canyon mining project. Surface facilities, in addition to improved roads, would be located on public lands within the deer winter range. In 1966, the area was two-way chained and seeded to crested wheatgrass, fourwing saltbush, and nomad alfalfa. After 20 years, the site was again dominated by the release of the young trees left after the original chaining. Pinyon and juniper density was estimated at 250 plants/acre (pinyon at 106 trees/acre and juniper at 149) in 1994, most were young trees. In 1996, the area was burned by a wildfire, afterward it was chained and apparently seeded with a dribbler. The wildfire eliminated all of the trees and nearly all of the shrubs. The only shrubs left are a few surviving mountain mahogany, bitterbrush, and resprouting green ephedra.

The site is on the Mud Springs grazing allotment, which is permitted for 338 cattle from mid-October to mid-June. The four pastures are rotated on the basis of forage condition and water availability as determined by the permittee. Cattle use on the site was light to moderate, but was very heavy during the 2005 reading. Judging from pellet groups, deer and elk use is light, with rabbit use being somewhat heavier. Pellet group data from the 2000 reading was estimated at 9 deer and 4 cow days use/acre (22 ddu/ha, 10 cdu/ha). Rabbit droppings were frequently encountered. In 2005, the estimated pellet group data was 7 elk, 6 deer, and 42 cow days use/acre (17 edu/ha, 15 ddu/ha, and 104 cdu/ha). During the 2005 reading, several head of cattle were on the site and most of the cattle use had been from fall through spring. Elk and deer use had been mainly from winter.

The soil is moderately deep, but fairly rocky and variable, demonstrated by the presence of both black sagebrush and mountain big sagebrush prior to the fire. Effective soil depth is estimated at 14 inches. It has a sandy clay loam texture with a soil reaction that is neutral (7.3 pH). Phosphorus was measured at just 5.2 ppm, where values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). There are patches of exposed soil, but overall ground cover is good and erosion minimal. Rocks and pavement are found in the bare areas and large rocks and boulders are common within the soil profile and on the surface. Many rocks in the soil profile contain a calcium carbonate crust. The erosion condition class determined soil movement as stable in 2005.

The most numerous shrub prior to the 1996 fire was black sagebrush. It had 9% cover in 1994 with a population of 6,080 plants/acre. The majority of these plants were mature and vigorous although rather heavily browsed in 1986. There were also some scattered mountain big sagebrush plants (180 plants/acre). Less numerous shrubs in the area included green ephedra (40 plants/acre) and true mountain mahogany (60 plants/acre). After the wildfire of 1996, there remained only a few surviving or resprouting fourwing saltbush (40 plants/acre), mountain mahogany (20 plants/acre), and green ephedra (200 plants/acre). Bitterbrush was seeded after the fire and was growing at 20 plants/acre in 2000. All of the fourwing and mountain mahogany and nearly all (90%) of the green ephedra were heavily hedged. In 2005, the fourwing saltbush remained at 40 plants/acre, mahogany increased slightly to 40 plants/acre, ephedra decreased to 160 plant/acre, and bitterbrush remained at 20 plants/acre.

Before and after the fire, crested wheatgrass was the dominant herbaceous plant. Plants are tall, vigorous and were lightly grazed until 2005, when grazing was heavy. Comparing photos from 2000 and 2005 clearly shows heavy cattle grazing. A few other valuable species, including Indian ricegrass, smooth brome, bluebunch wheatgrass, and mutton bluegrass are present, but provide only limited forage. Abundance of forbs is low and has produced less than 1% every year. Only four herbaceous species established from the post-fire seeding treatment: intermediate wheatgrass, orchardgrass, alfalfa, and small burnet.

1986 APPARENT TREND ASSESSMENT

The range appears to be in good condition. The key species, black sagebrush, is vigorous and productive. Although there is a fairly high percentage of decadent plants, there is a healthy number of young plants and the population appears stable. The one downward parameter is the increasing cover of the released pinyon and juniper, which in time could restrict growth and reproduction of more desirable browse species. Except for scattered bare patches, ground cover is excellent with little erosion. Therefore, the current soil trend appears to be stable also.

1994 TREND ASSESSMENT

The trend for soil is stable with percent bare ground decreasing slightly and a good cover value for grasses. The trend for browse is stable for the key browse species, black sagebrush. Percent decadence has declined (27% to 14%) and the percentage of plants that were moderate to heavily hedged has also gone down (67% to 1%). Trend for the herbaceous understory species is stable with nested frequency values that are almost unchanged from 1986. There was a slight decrease for the forbs, but altogether they provide less than 1% of the vegetation cover. The Desirable Components Index score was good due to moderate browse cover and good perennial grass cover.

TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - Good (52) Lower Potential scale

2000 TREND ASSESSMENT

Trend for soil is down with percent bare ground increasing and litter cover and vegetation cover declining. Since the fire, vegetation cover has changed from mainly shrub and tree cover to mostly herbaceous cover. Even with this change in composition, the ratio of bare soil to protective cover has decreased substantially. Erosion is not a noticeable problem on the site due to the abundant herbaceous cover combined with the gentle slope. Trend for browse is down due to a loss of most shrubs to fire. The few surviving preferred browse species are being heavily used but should increase through time. Trend for the herbaceous understory is up with an increase in the sum of nested frequency for perennial grasses and forbs. Nested frequency of the dominant grass, crested wheatgrass, remained stable but several other species increased. The DCI score decreased to fair due mainly to a nearly complete loss of browse cover, but an increase in perennial grass cover.

TREND ASSESSMENT

soil - down (-2)

browse - down (-2)

herbaceous understory - up (+2)

winter range condition (DC Index) - Fair (32) Lower Potential scale

2005 TREND ASSESSMENT

The trend for soil is slightly down. The ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground remained nearly identical from 2000 to 2005. However, the relative cover of bare ground increased from 34 to 52%, relative litter cover decreased from 27 to 16%, and relative vegetation cover decreased from 21 to 17%. Most of which is a product of high grazing pressure on the site. The trend for browse is stable. The site has few preferred browse individuals scattered across the site. Densities of

fourwing saltbush, mountain mahogany, and bitterbrush remained unchanged or increased very slightly. This population change is due to 100% heavy use on all preferred browse species. The herbaceous trend is stable. The sum of the nested frequency of perennial grasses, the most important component of the herbaceous understory, decreased minimally. Crested wheatgrass, the dominant grass species, did not change. The degradation again is a product of high livestock grazing pressure on the site. Perennial forbs showed a decrease in nested frequency, but it is of minor importance on this winter range. The DCI score remained fair with only a slight decrease in perennial forbs.

TREND ASSESSMENT

soil - slightly down (-1)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - Fair (31) Lower Potential scale

HERBACEOUS TRENDS --

Management unit 11B, Study no: 5

| Type | Species | Nested Frequency | | | | Average Cover % | | |
|-----------------------------|---------------------------|------------------|-----------------|------------------|-----------------|-----------------|-------|-------|
| | | '86 | '94 | '00 | '05 | '94 | '00 | '05 |
| G | Agropyron cristatum | 269 | 263 | 274 | 289 | 9.44 | 17.78 | 16.36 |
| G | Agropyron dasystachyum | 4 | - | - | - | - | - | - |
| G | Agropyron intermedium | a- | a- | b ⁴³ | a ¹ | - | 1.74 | .00 |
| G | Agropyron spicatum | - | 6 | - | - | .33 | - | - |
| G | Bouteloua gracilis | a- | b ¹² | a ³ | a ¹ | .10 | .03 | .03 |
| G | Bromus inermis | ab ¹² | ab ⁶ | a ⁴ | b ²¹ | .21 | .38 | .47 |
| G | Dactylis glomerata | - | - | 9 | - | - | .04 | - |
| G | Festuca ovina | a- | a- | b ¹⁵ | a ¹ | - | .09 | .00 |
| G | Oryzopsis hymenoides | 10 | 4 | 8 | 19 | .06 | .99 | .24 |
| G | Poa fendleriana | - | 7 | - | - | .21 | - | - |
| G | Sitanion hystrix | 1 | - | - | - | - | - | - |
| Total for Annual Grasses | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total for Perennial Grasses | | 296 | 298 | 356 | 332 | 10.36 | 21.06 | 17.11 |
| Total for Grasses | | 296 | 298 | 356 | 332 | 10.36 | 21.06 | 17.11 |
| F | Arabis selbyi | ab ² | b ¹¹ | a- | a- | .02 | - | - |
| F | Astragalus convallarius | a ¹³ | a ⁹ | ab ²¹ | b ³³ | .20 | .55 | .13 |
| F | Astragalus wingatanus | b ²¹ | a ¹⁵ | a- | a ² | .46 | .06 | .15 |
| F | Chenopodium fremontii (a) | - | - | 6 | 5 | - | .01 | .02 |
| F | Descurainia pinnata (a) | - | - | - | 3 | - | - | .00 |
| F | Gilia sp. (a) | - | - | - | 1 | - | - | .00 |
| F | Hedysarum boreale | 2 | - | 3 | 3 | - | .15 | .03 |
| F | Lesquerella ludoviciana | 3 | 7 | 5 | - | .01 | .01 | - |
| F | Linum lewisii | - | - | 8 | - | - | .02 | - |

| T y p e | Species | Nested Frequency | | | | Average Cover % | | |
|---------------------------|-------------------------------------|------------------|----------------|------------------|-----------------|-----------------|------|------|
| | | '86 | '94 | '00 | '05 | '94 | '00 | '05 |
| F | <i>Machaeranthera grindelioides</i> | 3 | 1 | - | - | .03 | - | - |
| F | <i>Medicago sativa</i> | 5 | - | 5 | - | - | .01 | - |
| F | <i>Penstemon cyanocaulis</i> | _b 17 | _a 5 | _a 4 | _a - | .01 | .03 | - |
| F | <i>Salsola iberica</i> (a) | - | _a - | _{ab} 12 | _b 13 | - | .04 | .03 |
| F | <i>Sanguisorba minor</i> | - | - | 1 | - | - | .03 | - |
| F | <i>Schoenocrambe linifolia</i> | _a - | _a 3 | _b 16 | _a 1 | .01 | .06 | .01 |
| F | <i>Sphaeralcea coccinea</i> | 3 | - | 6 | 5 | - | .01 | .06 |
| F | <i>Townsendia incana</i> | - | - | - | 1 | - | - | .00 |
| F | <i>Trifolium</i> sp. | - | - | - | 2 | - | - | .00 |
| Total for Annual Forbs | | 0 | 0 | 18 | 22 | 0 | 0.05 | 0.06 |
| Total for Perennial Forbs | | 69 | 51 | 69 | 47 | 0.76 | 0.94 | 0.38 |
| Total for Forbs | | 69 | 51 | 87 | 69 | 0.76 | 1.00 | 0.45 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 11B, Study no: 5

| T y p e | Species | Strip Frequency | | | Average Cover % | | |
|------------------|--------------------------------------|-----------------|-----|-----|-----------------|------|------|
| | | '94 | '00 | '05 | '94 | '00 | '05 |
| B | <i>Artemisia nova</i> | 78 | 0 | 0 | 8.85 | - | - |
| B | <i>Artemisia tridentata vaseyana</i> | 3 | 0 | 0 | .81 | - | - |
| B | <i>Atriplex canescens</i> | 0 | 2 | 2 | - | - | - |
| B | <i>Cercocarpus montanus</i> | 3 | 1 | 1 | 1.00 | .03 | .03 |
| B | <i>Ephedra viridis</i> | 2 | 2 | 3 | .41 | .15 | .15 |
| B | <i>Gutierrezia sarothrae</i> | 8 | 1 | 1 | .21 | - | - |
| B | <i>Juniperus osteosperma</i> | 0 | 0 | 0 | 3.00 | - | - |
| B | <i>Opuntia</i> sp. | 1 | 0 | 1 | - | - | - |
| B | <i>Pinus edulis</i> | 0 | 0 | 0 | 1.63 | - | - |
| B | <i>Purshia tridentata</i> | 0 | 1 | 1 | - | .15 | .15 |
| Total for Browse | | 95 | 7 | 9 | 15.93 | 0.33 | 0.33 |

CANOPY COVER, LINE INTERCEPT --
Management unit 11B, Study no: 5

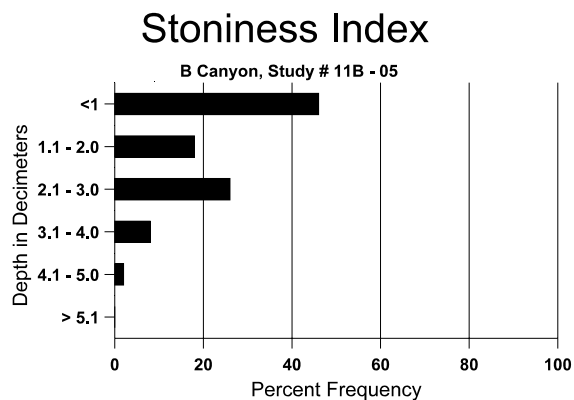
| Species | Percent Cover |
|--------------------|---------------|
| | '05 |
| Atriplex canescens | .13 |
| Ephedra viridis | .55 |

BASIC COVER --
Management unit 11B, Study no: 5

| Cover Type | Average Cover % | | | |
|-------------|-----------------|-------|-------|-------|
| | '86 | '94 | '00 | '05 |
| Vegetation | 11.50 | 28.43 | 24.17 | 17.87 |
| Rock | 7.00 | 10.55 | 13.60 | 13.45 |
| Pavement | 3.75 | 1.52 | 6.80 | 2.12 |
| Litter | 60.50 | 45.45 | 30.78 | 17.16 |
| Cryptogams | .75 | 2.80 | .63 | .04 |
| Bare Ground | 16.50 | 15.73 | 38.27 | 55.37 |

SOIL ANALYSIS DATA --
Herd Unit 11B, Study # 5, Study Name: B Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH | %sand | %silt | %clay | %OM | ppm P | ppm K | dS/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
| 13.7 | 51.4 (13.8) | 7.3 | 51.0 | 26.4 | 22.6 | 2.2 | 5.2 | 124.8 | 0.7 |



PELLET GROUP DATA --

Management unit 11B, Study no: 5

| Type | Quadrat Frequency | | |
|--------|-------------------|-----|-----|
| | '94 | '00 | '05 |
| Rabbit | 20 | 66 | 27 |
| Elk | 1 | - | 10 |
| Deer | 35 | 20 | 11 |
| Cattle | - | 1 | 12 |

| Days use per acre (ha) | |
|------------------------|----------|
| '00 | '05 |
| - | - |
| - | 7 (17) |
| 9 (22) | 6 (15) |
| 5 (11) | 42 (104) |

BROWSE CHARACTERISTICS --

Management unit 11B, Study no: 5

| | | Age class distribution (plants per acre) | | | | | Utilization | | | | | |
|--------------------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Y | Plants per Acre (excluding seedlings) | Seedling | Young | Mature | Decadent | Dead | % moderate | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Artemisia nova</i> | | | | | | | | | | | | |
| 86 | 6132 | 400 | 600 | 3866 | 1666 | - | 10 | 67 | 27 | - | 3 | 9/16 |
| 94 | 6080 | 100 | 520 | 4700 | 860 | 220 | 31 | .65 | 14 | 3 | 3 | 15/21 |
| 00 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| 05 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| <i>Artemisia tridentata vaseyana</i> | | | | | | | | | | | | |
| 86 | 200 | - | - | 200 | - | - | 100 | 0 | 0 | - | 0 | 20/20 |
| 94 | 180 | - | 20 | 140 | 20 | - | 44 | 0 | 11 | - | 0 | 16/28 |
| 00 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| 05 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | 10/15 |
| <i>Atriplex canescens</i> | | | | | | | | | | | | |
| 86 | 66 | - | - | - | 66 | - | 0 | 0 | 100 | - | 0 | -/- |
| 94 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| 00 | 40 | - | 40 | - | - | - | 0 | 100 | 0 | - | 0 | -/- |
| 05 | 40 | - | - | 40 | - | - | 0 | 100 | 0 | - | 0 | 18/20 |
| <i>Cercocarpus montanus</i> | | | | | | | | | | | | |
| 86 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 94 | 60 | - | - | 60 | - | - | 33 | 0 | - | - | 0 | 38/42 |
| 00 | 20 | - | - | 20 | - | - | 0 | 100 | - | - | 0 | 9/8 |
| 05 | 40 | - | - | 40 | - | - | 0 | 100 | - | - | 0 | 14/11 |
| <i>Ephedra viridis</i> | | | | | | | | | | | | |
| 86 | 66 | - | - | 66 | - | - | 100 | 0 | - | - | 100 | 36/25 |
| 94 | 40 | - | - | 40 | - | - | 0 | 0 | - | - | 0 | 26/24 |
| 00 | 200 | - | 20 | 180 | - | - | 10 | 90 | - | - | 0 | 11/12 |
| 05 | 160 | - | - | 160 | - | - | 0 | 100 | - | - | 0 | 14/27 |

| | | Age class distribution (plants per acre) | | | | | Utilization | | | | | |
|------------------------------|--|--|-------|--------|----------|------|---------------|------------|---------------|------------|--------------------|------------------------------------|
| Y e a r | Plants per Acre (excluding seedlings) | Seedling | Young | Mature | Decadent | Dead | % moderate | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Gutierrezia sarothrae</i> | | | | | | | | | | | | |
| 86 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 94 | 300 | - | 60 | 240 | - | - | 0 | 0 | - | - | 0 | 8/7 |
| 00 | 20 | - | - | 20 | - | - | 0 | 0 | - | - | 0 | -/- |
| 05 | 20 | - | - | 20 | - | - | 0 | 0 | - | - | 0 | 5/8 |
| <i>Juniperus osteosperma</i> | | | | | | | | | | | | |
| 86 | 266 | - | 66 | 200 | - | - | 25 | 25 | - | - | 0 | 72/35 |
| 94 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 00 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 05 | 0 | - | - | - | - | 20 | 0 | 0 | - | - | 0 | -/- |
| <i>Opuntia</i> sp. | | | | | | | | | | | | |
| 86 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 94 | 20 | - | - | 20 | - | - | 0 | 0 | - | - | 0 | 5/13 |
| 00 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | 6/16 |
| 05 | 40 | - | - | 40 | - | - | 0 | 0 | - | - | 0 | 2/10 |
| <i>Pinus edulis</i> | | | | | | | | | | | | |
| 86 | 132 | - | 66 | 66 | - | - | 0 | 0 | - | - | 0 | 108/71 |
| 94 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 00 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 05 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| <i>Purshia tridentata</i> | | | | | | | | | | | | |
| 86 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 94 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 00 | 20 | - | 20 | - | - | - | 0 | 0 | - | - | 0 | 13/24 |
| 05 | 20 | - | - | 20 | - | - | 0 | 100 | - | - | 0 | 10/18 |